Bonner zoologische Beiträge	Band 56	Heft 3	Seiten 175–183	Bonn, September 2009

A new species of *Surdisorex* Thomas, 1906 (Mammalia, Soricidae) from western Kenya

Julian Kerbis Peterhans[1,2], William T. Stanley[2], Rainer Hutterer[3], Terrence C. Demos[4] & Bernard Agwanda[5]

[1] Roosevelt University, Chicago, U.S.A.
[2] Division of Mammals, Field Museum of Natural History, Chicago, U.S.A.
[3] Section of Mammals, Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany
[4] Department of Biology, The Graduate Center, City University of New York, New York, U.S.A.
[5] Section of Mammals, National Museums of Kenya, Nairobi, Kenya

Abstract. The genus *Surdisorex* represents Kenya's only endemic genus of mammal. It has heretofore included two species from the highlands of central Kenya. Here we add a third species, also from Kenya, based on a specimen from the ericaceous zone of the eastern slopes of Mt. Elgon. Although this species further aligns Mt. Elgon with the Kenya Highlands, the mammal fauna of Mt. Elgon illustrates a mixture of faunal origins and associations.

Keywords. *Surdisorex*, mole shrews, endemism, fossorial mammals, Mt. Elgon.

1. INTRODUCTION

In 1906, Thomas erected the genus *Surdisorex* for a highly specialized burrowing shrew, without external pinnae, from the Aberdare Mountains of central Kenya. Ten years later, a second species of the genus was named by Hollister (1916) from nearby Mt. Kenya. For over 100 years, the genus *Surdisorex* has been Kenya's only endemic genus of mammal. Even with the acquisition of large series of each taxon, the two species remain readily diagnosable despite their geographic proximity. Hollister (1918) stated that both species were confined to high altitudes (above 9,000'). Their occurrence on mountain tops appears to account for their isolation and distinction, despite a geographic disjunction of less than 50 miles.

In 1984, a specimen of the genus *Surdisorex* was picked up on a footpath in the ericaceous zone of the Kenyan slope of Mt. Elgon. We describe it as a third member of the genus *Surdisorex*. It is surprising that this distinctive animal had gone uncollected from this often-studied mountain until now.

2. MATERIALS AND METHODS

The sole representative of the new species was found dead on the footpath by Dr. Henning Grossman at 3,150 m in the ericaceous zone of Mt. Elgon in December, 1984 and donated to Professor Kim M. Howell, Department of Zoology, University of Dar es Salaam who assigned it the field number KMH 3213. Professor Howell donated the specimen to the Field Museum of Natural History in 2005. The specimen was partially eviscerated with the loss of internal viscera and external reproductive organs, but we do not know how or when this occurred. It was kept in the Tanzanian collection, and stored in ethanol for some 20 years under the name '*Myosorex* sp.' Exposure to light may have discolored the pelage.

We compared the specimen with specimens in the American Museum of Natural History (AMNH), The Natural History Museum, London (BMNH), Field Museum of Natural History, Chicago (FMNH), the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM), and the Zoologisches Forschungsmuseum Alexander Koenig, Bonn (ZFMK). The following external measurements were recorded for each specimen: total length (TOL; tip of nose to end of caudal vertebrae), head and body length (HB; tip of nose to base of tail), tail length (TL; from base of tail to end of caudal vertebrae), hind foot length (HF; from heel to tip of claw), ear height (E; the longest dimension of the opening of the auditory meatus) and weight (WT). All measurements are in mm except weight (grams), and generally follow DeBlase & Martin (1974). The cranial and dental variables measured are condylo-incisive length (CI), post-palatal length (PPL), length of entire upper toothrow (UTR), length of complex teeth in upper toothrow, i.e. the distance from the anterior edge of the fourth upper premolar to the posterior edge of the third upper molar (P^4-M^3), distance from anterior edge of first upper incisor to posterior edge of upper canine (UNICUSP), width of third upper incisor (I^3W), width of canine (CW), length of third upper molar (M^3L), width of third upper molar (M^3W), least interorbital width (IO), bimaxillary width (MX), greatest width of the braincase (GB), post-glenoid width (PGL), height of the cranial capsule (HCC), length of mandible including the incisor (md), height of coronoid process on dentary (cor), and length of lower toothrow (ltr). These variables are a subset of those utilized by HUTTERER & KOCK (2002), DIPPENAAR (1977), and CARRAWAY (1990) and are figured in STANLEY et al. (2005). The infraorbital bridge was measured at its narrowest point; the structure was figured by MEESTER (1963). Digital callipers were used to measure skulls to the nearest 0.01 mm.

Standard descriptive statistics (mean, range, and standard deviation) were calculated for each species. One-way analysis of variance (ANOVA) was used to determine whether there were significant differences in cranial characters between sexes in each species. Principal components were extracted from a variance-covariance matrix using the cranial variables converted to natural logarithms. All univariate and multivariate statistical analyses were conducted using Systat (version 11.00, 2004).

3. RESULTS

External measurements indicate that *S. polulus* has a shorter head and body, but longer tail and hindfoot than *S. norae* (Table 1). Unfortunately, no external measurements were recorded from the specimen found on Mt. Elgon at the time of collection. The tail and hindfoot measurements taken from the preserved specimen indicate this specimen had a longer tail than either of the other two species, but the hindfoot length was intermediate between *S. norae* and *S. polulus*.

In general, the specimen from Mt. Elgon falls between the means of *S. norae* and *S. polulus* in various length measurements of the skull (Table 2). One-way Analysis of Variance indicated there was no sexual dimorphism in cranial characters between sexes in either *S. norae* or *S. polulus*. The one exception was in *S. norae*, where the males had a longer toothrow on the dentary than females ($F = 5.14$; $P \leq 0.05$). Based on the fact that this was the only character exhibiting significant differences between sexes, and that this difference was found in only one species, the sexes were combined in all other analyses.

Table 1. External measurements (in mm) for samples of *Surdisorex*, given as mean, standard deviation, range and sample size. Measurements of *S. norae* and *S. polulus* taken from specimens upon capture, and those of *S. schlitteri* from the preserved specimen.

External measurement	Head & body	Tail length	Hindfoot
Surdisorex norae	102.2 ± 4.1 95–110 n = 19	28.2 ± 3.5 21–33 n = 19	15.6 ± 1.2 14–17.5 n = 19
Surdisorex polulus	94.8 ± 3.1 89–100 n = 11	28.5 ± 2.3 24–31 n = 11	16.5 ± 0.5 16–17 n = 11
Surdisorex schlitteri	–	28.6	16.1

Principal components analysis resulted in skull length measurements generally having positive and moderately high loadings with the first component. For example, the variable with the highest loading on PC 1 was the condylo-incisive length (CI). PC 2 was most heavily influenced by the length of the row of upper unicuspids (length from first upper incisor to the canine), which had positive loadings. Equally influential on the second component (but with negative loadings), was the width of the third upper incisor (I^3W). The third component was most influenced by the width of the third upper molar, (M^3W) which exhibited negative values. The first three components explained 40.1, 22.3 and 16.1% of the variation, respectively. A plot of the specimen scores on the first two components extracted is shown in Fig. 1.

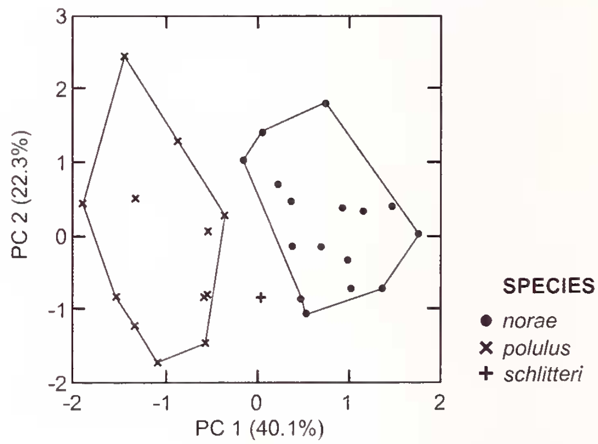

Fig. 1. Plot of the specimen scores on the first two principal components, based on cranial measurements.

Table 2. Comparison of selected cranial measurements (mm) for 3 species of *Surdisorex*, given as mean, ± standard deviation, sample size and range.

Character	*S. schlitteri* (n = 1)	*S. norae*	*S. polulus*
Condylo-incisive length (CI)	25.15	25.79 ± 0.37 (n = 13) 25.24–26.75	24.68 ± 0.30 (n = 8) 24.35–25.06
Post-palatal length (PPL)	11.28	11.38 ± 0.24 (n = 10) 11.05–11.86	10.99 ± 0.21 (n = 7) 10.59–11.25
Upper toothrow length (UTR)	10.55	11.03 ± 0.22 (n = 21) 10.55–11.48	10.43 ± 0.20 (n = 18) 10.01–10.75
Length of P^4-M^3 (P^4-M^3)	6.10	6.28 ± 0.15 (n = 17) 6.02–6.59	6.02 ± 0.14 (n = 15) 5.81–6.29
Length of upper unicuspids (UNICUSP)	4.45	4.75 ± 0.13 (n = 17) 4.53–5.02	4.40 ± 0.14 (n = 15) 4.13–4.61
Greatest width of upper I^3 (I^3W)	0.72	0.71 ± 0.05 (n = 17) 0.62–0.76	0.70 ± 0.05 (n = 15) 0.61–0.79
Greatest width of upper canine (CW)	0.77	0.82 ± 0.04 (n = 17) 0.72–0.87	0.78 ± 0.03 (n = 15) 0.72–0.84
Greatest length of upper M^3 (M^3L)	1.62	1.58 ± 0.07 (n = 17) 1.42–1.68	1.49 ± 0.08 (n = 14) 1.40–1.68
Greatest width of upper M^3 (M^3W)	0.87	0.87 ± 0.05 (n = 17) 0.80–0.97	0.84 ± 0.05 (n = 15) 0.76–0.94
Interorbital width (IO)	5.43	5.30 ± 0.14 (n = 16) 5.08–5.50	5.22 ± 0.19 (n = 13) 4.82–5.54
Maxillary breadth (MX)	7.00	7.26 ± 0.18 (n = 20) 6.93–7.56	6.84 ± 0.16 (n = 18) 6.53–7.12
Greatest breadth of cranium (GB)	12.90	13.17 ± 0.29 (n = 13) 12.50–13.72	12.50 ± 0.20 (n = 9) 12.04–12.68
Post-glenoid width (PGL)	8.10	8.29 ± 0.25 (n = 17) 7.86–8.76	7.98 ± 0.18 (n = 11) 7.59–8.18
Height of cranial capsule (HCC)	6.23	6.62 ± 0.18 (n = 16) 6.36–7.03	6.38 ± 0.19 (n = 8) 6.03–6.60
Length of mandible (md)	16.41	16.58 ± 0.36 (n = 20) 15.83–17.34	15.81 ± 0.17 (n = 17) 15.58–16.28
Coronoid height (cor)	6.70	6.64 ± 0.22 (n = 21) 6.36–7.13	6.41 ± 0.17 (n = 18) 6.17–6.73
Lower toothrow length (ltr)	9.70	9.99 ± 0.19 (n = 21) 9.65–10.42	9.46 ± 0.19 (n = 18) 9.13–9.71

3.1. The Mt. Elgon Mole Shrew

Surdisorex schlitteri n. sp.

Holotype. FMNH 195069 (KMH 3213). Old adult, teeth heavily worn, sex indeterminate although suspected to be male since no teats are visible. Secondary number KMH 3213. Collected by H. Grossman in December 1985. Specimen prepared as fluid-preserved body with skull removed.

Type locality. Kenya, eastern flank of Mt. Elgon, ericaceous zone at 3,150 m.

Etymology. The specific epithet honors Dr. Duane Schlitter, recognizing his important contributions to the knowledge of African small mammals and his personal and scientific engagement in Kenya.

Diagnosis. Intermediate in cranio-dental dimensions compared with the other two species in the genus, *S. polulus* and *S. norae*. Braincase smaller and absolutely shorter. The more anterior position of the pair of anterior palatal foramina is unique within the genus, as is the position of the last palatal foramen, situated between the second pair of unicuspids. Infraorbital bridge narrow. The lingual extension of the upper P^4 is longer than in the other

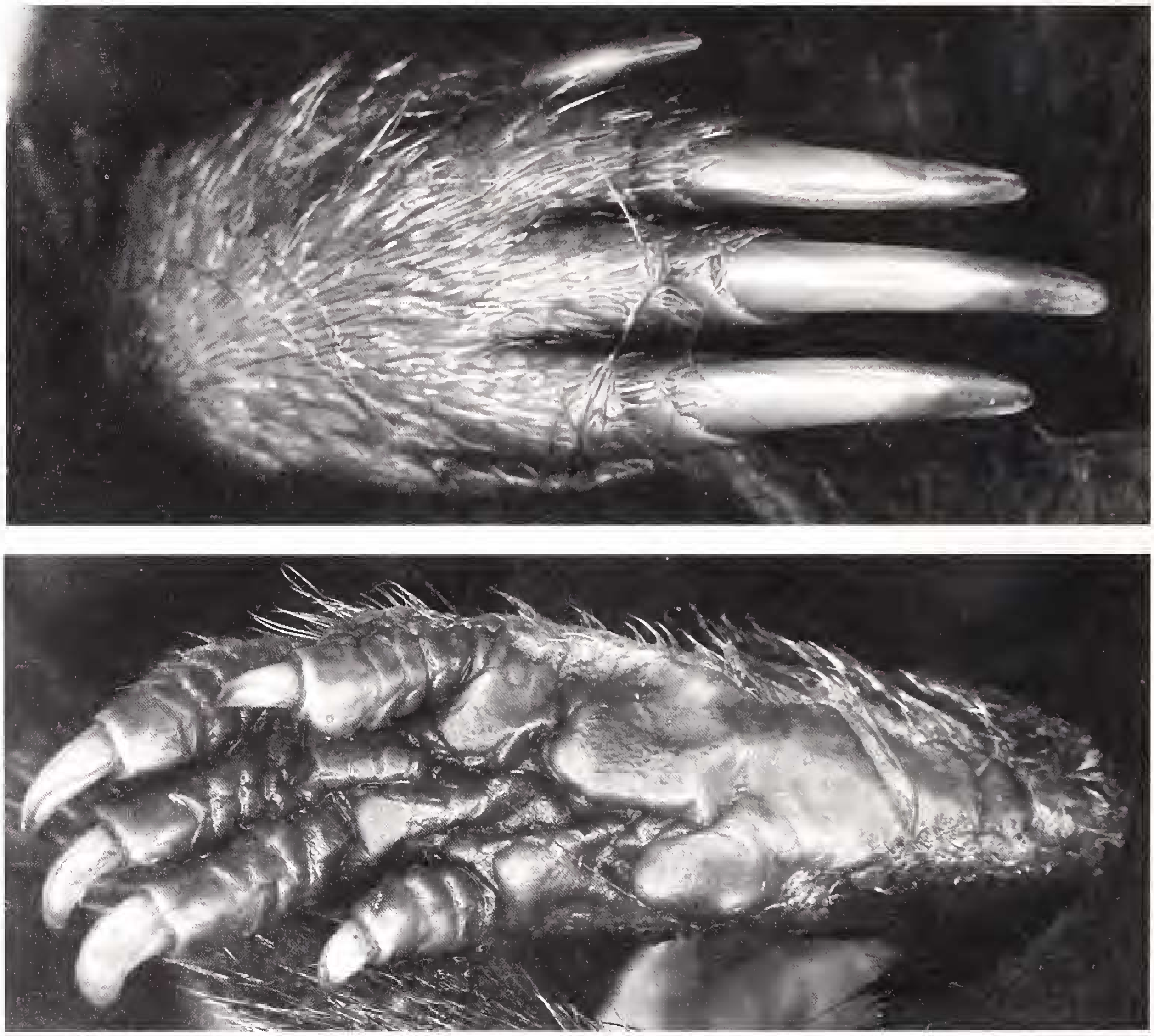

Fig. 2. Fore- and hindfoot of the holotype specimen of *Surdisorex schlitteri* n. sp. (FMNH 195069); length of hindfoot (including claws) is 16.1 mm.

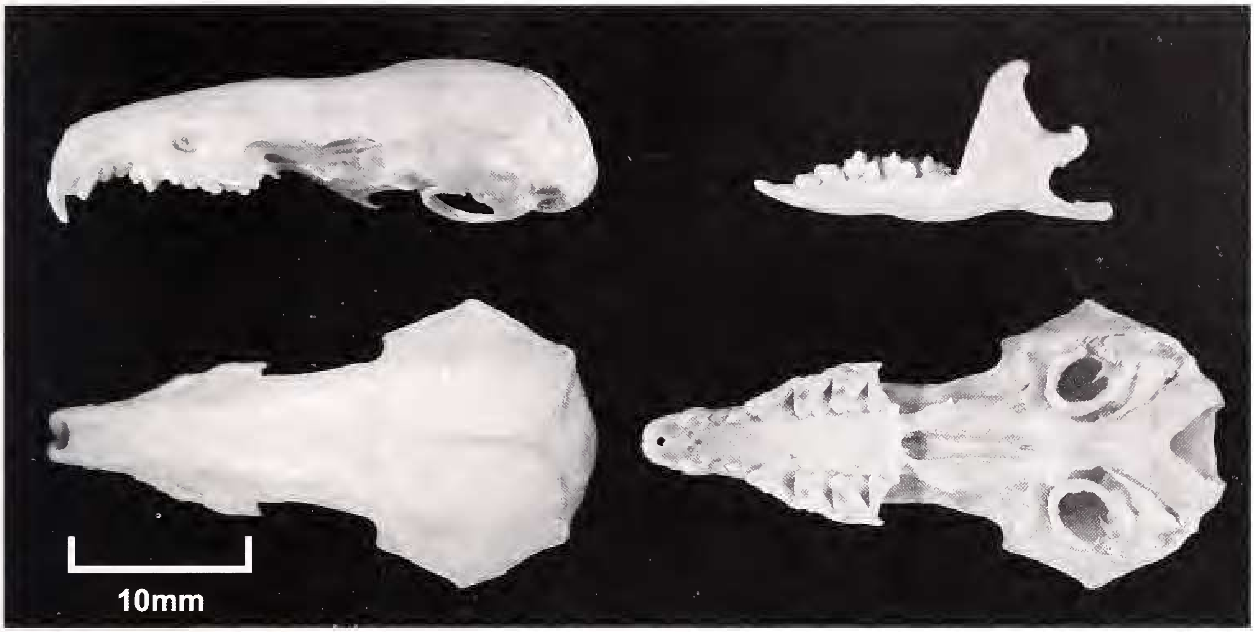

Fig. 3. Skull of *Surdisorex schlitteri* n. sp. (FMNH 195069, holotype); cranium in lateral, dorsal and ventral view, mandible in lateral view.

members of the genus, and almost in contact with the anterior edge of M^1. Lower P_4 narrow. Mandibular condyle heavy and straight-sided, forming a near-triangle without sinuosity.

Description. The new species exhibits characters typical for the genus. The tail is short (28.6/84=34% of Head and Body). Fur is thick and woolly, length of single hairs on dorsum 9 mm. Color faded, presumably because of long-term preservation in alcohol, base of hairs dark brown, terminal 2 mm lighter. The foreclaws greatly enlarged, hindclaws moderately so (Fig. 2). Ear conch absent. Eyes reduced and covered in membrane. Skull hexagonal, typical of burrowing Soricidae (e.g. *Myosorex*, *Anourosorex*, *Blarina*) with particularly well-defined anterior facets of the braincase (Fig. 3). Interorbital region elongate (between posterior processes of maxilla and anterior aspect of the braincase). Bridge across infraorbital foramen narrow (1.87 mm). Nuchal crests well-developed, sagittal crest slight. Braincase small and short, as reflected in the measurement from the anteromost corner of the braincase to the corresponding occipital condyle and in the distance of the antero-lateral component of the hexagon-shaped braincase. Foramen magnum oval-shaped. Paired frontal foramina within interorbital basin. This basin provides a sinuous curve to the lateral profile of the skull.

Three upper and two lower unicuspids, both unicuspid rows void of the vestigial unicuspids typical of *Myosorex*. Unicuspids broad, each with a medial accessory cusplet. Protocone of P^4 very prominent, forming a prominent shelf with parastyle. Upper M^1 and M^2 without metaloph. Lower incisor denticulate, with chisel-like tip. Mental foramen beneath second cusp of lower P_3. Lower P_4 fairly narrow, exhibiting the inverted v-shape pattern typical of the Myosoricinae (Hutterer et al. 2002). Lower M_3 with well-developed and deep entoconid basin (Meester 1963).

Meester (1958) found that palatal foramina are useful in distinguishing closely related species of primitive African Soricidae (i.e. *Myosorex*). For the new taxon, the three principle anterior incisive foramina are tightly clustered in a triangle. The anterior pair is positioned slightly anterior to the medially positioned third member of this triad, this pair being located in a plane even with the anteromost portion of the first unicuspid (Fig. 3). The third foramen of this triad is positioned just below the anterior pair and is still situated within the anterior half of the first unicuspid. These foramina are followed by two reduced foramina, located approximately midway down the first unicuspid. A final foramen, the sixth, is located midway down from the second unicuspid.

4. COMPARISONS

In most cranio-dental measurements, *Surdisorex schlitteri* is intermediate in size between *S. norae*, the largest member of the genus and *S. polulus*, the smallest (Table 2). This

Table 3. Comparison of selected cranial measurements (mm) for 3 species of *Surdisorex*, given as mean, ± standard deviation, range and sample size.

Character	*S. norae*	*S. polulus*	*S. schlitteri*
Condylo-incisive length	25.8 ± 0.3 25.2–26.7 (n = 21)	24.6 ± 0.3 23.8–25.1 (n = 15)	25.1
Post-palatal length	11.4 ± 0.2 11.0–11.9 (n = 18)	10.9 ± 0.3 10.5–11.2 (n = 13)	11.3
Upper toothrow length	11.0 ± 0.2 10.6–11.5 (n = 21)	10.4 ± 0.2 10.0–10.7 (n = 15)	10.5
Length of P^4-M^3	6.3 ± 0.2 6.0–6.6 (n = 18)	6.0 ± 0.1 5.8–6.3 (n = 14)	6.1
Length of upper unicuspid teeth	4.9 ± 0.2 4.6–5.5 (n = 18)	4.6 ± 0.4 4.2–5.4 (n = 14)	4.4
Greatest width of upper I^3	0.7 ± 0.0 0.6–0.8 (n = 18)	0.7 ± 0.1 0.6–0.8 (n = 14)	0.7
Greatest width of upper canine	0.8 ± 0.0 0.7–0.9 (n = 18)	0.8 ± 0.0 0.7–0.8 (n = 14)	0.8
Greatest length of upper M^3	1.6 ± 0.1 1.4–1.7 (n = 18)	1.5 ± 0.1 1.4–1.7 (n = 14)	1.6
Greatest width of upper M^3	0.9 ± 0.1 0.8–1.0 (n = 18)	0.8 ± 0.0 0.8–0.9 (n = 14)	0.9
Interorbital width	5.3 ± 0.2 5.1–5.6 (n = 21)	5.3 ± 0.2 5.0–5.6 (n = 15)	5.4
Maxillary width	7.3 ± 0.2 7.0–7.6 (n = 21)	6.9 ± 0.2 6.5–7.2 (n = 15)	7.0
Greatest width of cranium	13.2 ± 0.3 12.5–13.7 (n = 18)	12.6 ± 0.3 12.0–13.2 (n = 15)	12.9
Post-glenoid width	8.3 ± 0.2 7.9–8.9 (n = 21)	8.0 ± 0.2 7.6–8.5 (n = 15)	8.1
Height of cranial capsule	6.7 ± 0.2 6.4–7.0 (n = 21)	6.4 ± 0.2 6.0–6.7 (n = 14)	6.2
Length of mandible	16.6 ± 0.3 16.1–17.3 (n = 21)	15.8 ± 0.1 15.5–16.0 (n = 15)	16.4
Coronoid height	6.6 ± 0.2 6.3–7.0 (n = 21)	6.4 ± 0.2 6.0–6.8 (n = 15)	6.7
Lower toothrow length	10.0 ± 0.2 9.6–10.4 (n = 21)	9.4 ± 0.2 9.1–9.7 (n = 15)	9.7

intermediate position is reflected in its position between the other two species along the primary axis of the first Principle Component (Fig. 1), an axis that illustrates size differences. Its infraorbital bridge is narrower (1.87) than either *norae* (1.97 and 2.26) or *polulus* (2.13 and 2.16). Its mandibular condyle is heavy and straight-sided and more or less triangular, without the sinuosity seen in the other two species.

The new species can be distinguished from *S. polulus* by its generally larger size in most cranial and dental dimensions (CI, MX, GB, md, ltr: Table 2). In the new species, the central foramen of the anterior triad is located posterior to the triad pair whereas in *S. polulus*, it is situated slightly ahead, between the incisor and the first unicuspid. The second pair of palatal foramina is in a comparable position between these species, but in the new species, the sixth and postero-most palatal foramen is located between the second unicuspids instead of between the first and second unicuspids, as in *S. polulus*.

From *Surdisorex norae*, the new species can be distinguished by its generally smaller size in most dimensions: (CI, MX, GB, I1-P3 length, ltr; Table 2). In the new form, the antero-lateral dimension of the hexagonal edge of the braincase is 4.63, compared with 4.79 and 5.15 in *S. norae*. The distance from the antero-lateral corner of the braincase to the corresponding occipital condyle is 10.11 vs. 10.18 and 10.93 in *S. norae*. The lower P_4 is narrower than in *S. norae*.

The shorter length of the upper unicuspids in the new species gives them a relatively broader apppearance than those of *S. norae*. This is especially clear in the first and third unicuspids. The angle in the posterior fovea of the upper P^4 is about 90° in the new form vs. 120° in *Surdisorex norae*; therefore there is no medial gap between the P^4 and M^1 in the new form compared with *norae*.

The anterior pair of palatal foramina in *Surdisorex norae* is positioned more posteriorly than in the new species, such that they form a straight line across the anterior half of the first unicuspid. The next pair is positioned comparable to the condition seen in the new species, whereas the final foramen is located midway down the third unicuspid.

A distinct sinus canal foramen (Meester 1963) is visible on the left side of the pterygoid region of the new species. It is less well-developed but evident on the right side. In other members of the genus, a canal replaces the foramen. A larger series is necessary to determine the significance of this feature.

There is no east to west size cline among the species of *Surdisorex*, further demonstrating their mutual distinction. The largest species is *Surdisorex norae* from the Aberdare Mountains, which is located between the populations of *S. schlitteri* and *S. polulus*.

Ecology of *Surdisorex* spp. The ecology of *Surdisorex* spp. is poorly known; to date there has only been a single published paper on the subject (Duncan & Wrangham 1971). We have little data to report for *S. schlitteri*. Represented by a single specimen, *S. schlitteri* is only known from the ericaceous zone of Mt. Elgon. The Kenyan slope of Mt. Elgon was specifically surveyed for subterranean insectivores by Duncan & Wrangham (1971) without finding this species. However, these authors note that on Mt. Elgon, burrows of the golden mole (*Chrysochloris stuhlmanni fosteri*; species rank suggested by Thorn & Kerbis Peterhans 2009) are 'common in fairly open ground in the ericaceous zone up to 10,000 feet <3048m>'. The golden mole is known from the ericaceous zone of Mt. Elgon and the nearby Cherangani Hills. The study of Duncan & Wrangham (1971) showed that *Chrysochloris fosteri* feeds mainly on earthworms, supplemented by smaller oligochaetes. Earthworms were predominant in the diet of *S. norae* (Aberdares range) and *S. polulus* (Mt. Kenya). They concluded that *Surdisorex* and *Chrysochloris* share an earthworm diet and mole-like habits. In turn, this may have contributed to ecological displacement, mutually excluding these vermivores from overlapping ranges during times of climatic amelioration. Though this is a reasonable conclusion, the new record of *S. schlitteri* contradicts this view. The occurrence of *S. schlitteri* on Mt. Elgon also calls into question the recognition of *Chrysochloris* vs. *Surdisorex* burrows by visual recognition alone.

Reporting on the Oxford University Expedition of 1969, Duncan & Wrangham (1971) documented *S. norae* and *S. polulus* in bamboo, mixed *Podocarpus*/bamboo and swamp. In the Aberdares, *S. norae* was collected at Kiandongoro Gate (specimens in BMNH) along a swamp in moorland at 9,400' (=2,865 m). Our 2006 efforts (JCK, TCD, BA) documented a single *S. norae* on the Aberdares at 2,700 m (=8860') in secondary forest, the lowest vouchered record for the genus, but none at 2,200 m (=7220'). During our surveys, *S. norae* was extremely common at 3,300 m (10,830') in *Hagenia* forest, *Carex* tussock grass and alpine shrubs and meadows. Heller collected *S. norae* on the summit of the Aberdares at 11,000' (specimens at USNM; Appendix). Our collated data (Appendix) indicates that *S. norae* ranges between 2,700 m and 3,350 m.

With a single exception, all records of *S. polulus* originate from the west slope of Mt. Kenya. This may be an artefact of site access and collecting bias. The lowest record from Mt. Kenya (AMNH 82479) is at 9,000' (2,743 m) and the highest records are from 12,100' (= 3,690 m, USNM records). Records of *S. polulus* from Mt. Kenya in the BMNH collected by the Oxford Expedition of 1969 originate near the Naro Moru Track at 10,500' (= 3,200 m). They derive from a range of bamboo associated habitats including mixed bamboo, bamboo/*Podocarpus* forest, bamboo mixed with 6" grass and swamp near bamboo (Oxford Expedition of 1969, specimens in BMNH). LORING (1910) describes them as common in grassy openings within bamboo thickets at 10,000'. At other elevations (10,700' and 12,100') they frequented *Otomys* sp. runs in tall marsh grass.

5. DISCUSSION

This remarkable discovery suggests a relictual biotic association between Mt. Elgon and the nearby Kenyan Highlands to the east (The Aberdares and Mt. Kenya). The three known species of *Surdisorex* ssp. are confined to upper montane forest (uncommon), bamboo, and ericaceous and alpine zones above 2,700 m. The three taxa are mutually isolated due to their confinement to high montane habitats.

Mt. Elgon has been well surveyed over the past 100 years. For the Ugandan slope, this includes: LOVERIDGE in 1933–1934 (ALLEN & LAWRENCE 1936), DAVENPORT et al. (1996); CLAUSNITZER & KITYO (2001); CLAUSNITZER (2003); CLAUSNITZER et al. (2003). In addition to the report of DUNCAN & WRANGHAM (1971), historical expeditions to the Kenyan slope of Mt. Elgon to collect small mammals include those of KEMP in 1909 (reviewed in LOVERIDGE 1937), BAYER in 1914 (LONNBERG 1918), the Swedish Expedition of 1920 (GRANVIK 1924), and LOVERIDGE in 1934 (ALLEN & LAWRENCE 1936). The absence of *Surdisorex* in prior reports is surprising. The genus is extremely common in bamboo/alpine zones of the Aberdares and Mt. Kenya. Perhaps its co-occurrence with *Chrysochloris fosteri* on Mt. Elgon limits its abundance.

Mt. Elgon lies at the confluence of three major faunistic regions: the Albertine Rift and Congo basin to the west, the Kenya Highlands to the east, and the northern highlands of Tanzania to the south. It houses representatives of two or three of these systems (summarized in CARLETON et al. 2006): *Sylvisorex granti* group, *Colomys goslingi* (Ruwenzoris, Albertine Rift); *Crocidura elgonius, Crocidura fumosa, Surdisorex* sp., *Rhabdomys dilectus*, and possibly *Cricetomys ansorgei* (Kenya Highlands); and perhaps from the third as well (northern highlands of Tanzania): *Lophuromys aquilus* (MUSSER & CARLETON 2005), *Hylomyscus anselli* (BISHOP 1979). Mt. Elgon also houses a few strict endemics of its own (*Otomys barbouri*, *Otomys jacksoni*). Although our knowledge of the alpha taxonomy of the small mammals in the region is incomplete, the central position of this extinct volcano reflects influences from multiple montane biotic systems.

Acknowledgements. We thank Dr. H. Grossman for collecting the first member of the new species and to K. Howell for providing access to the specimen. We thank the Government of Kenya, including the Office of the President for the research permit (MOEST 13/001/30C/57) to the senior author. We thank the staff of the National Museums of Kenya (Dr. Idle Farah, Director) and Mr. Ogeto Mwebi (Head, Section of Osteology) for their continued support. For assistance in the field, we recognize, F. Awuor, D. Muruthi and B. Ochieng. For permission to work in Aberdare Mountain NP, we recognize Ms. Catherine Wambani, the Senior Warden, without whose assistance supplemental field work would not have been possible. D. Ogada, Father Boniface and the Gataragwa Catholic Parish provided key logistical support adjacent to Aberdare Mountain NP. Finally, we recognize the staff of the following institutions for their assistance: AMNH (D. Lunde), BMNH (P. Jenkins, D. Hills), FMNH (M. Schulenberg, J. Phelps), USNM (M. Carleton, L. Gordon, H. Kafka), and ZFMK (T. Wagner). We acknowledge the Barbara Brown Fund of the Field Museum for financial support. Rebecca Banasiak and Dirk Rohwedder helped with preparation of figures.

Zusammenfassung. *Surdisorex* ist die einzige endemische Säugetiergattung Kenias. Bisher enthielt die Gattung zwei Arten, die in den zentralen Hochländern Kenias beheimatet sind. Hier fügen wir eine dritte Art hinzu, ebenfalls aus Kenia, basierend auf einem Exemplar von der Ericaceen-Zone der Ostflanke des Mount Elgon. Diese neue Art, *Surdisorex schlitteri* n. sp., verbindet Mount Elgon zoogeografisch mit den Hochländern Kenias, doch weist die Säugetierfauna des Mount Elgon auch eine spezielle Mischung faunistischer Einflüsse auf.

APPENDIX

Specimens examined. *Surdisorex norae* (THOMAS, 1906): all records from Aberdare Mountain NP, Kenya. AMNH 187262, 8 mi W of Bellevue (female); BMNH 6.7.8.1 (type), east side, near Nyeri, 9500', old female; BMNH 10.5.3.1, 11,000' (female); BMNH 1974.653-74.657, Kiandongoro Gate, 9,400' (3 females, 2 males); FMNH 190257-190266, FMNH 190623-190626, 28.5 km W & 4.9 km N of Nyeri, 3,100 m (6 males, 8 females), FMNH 190622, 3.8 km W & 2.5 km S of Gatarakwa, 2,700 m (male); USNM 165513-166515, (1 female, 2 males), 182581-182586, summit, 11,000' (2 females, 4 males), USNM 589811-589813, USNM 589815-589818, Fishing Lodge, 9,000'–9,500' (1 female, 6 males).

Surdisorex polulus (Hollister, 1916): all but AMNH record, from W slope, Mt Kenya, Kenya. AMNH 82479, E slope, 9,000' (female); BMNH 1974.646-1974.652, Naro Moru Track, 10,500' (3 females, 2 males, 2 ?); FMNH 43845=USNM 163980, 12100' (female), FMNH 43846=USNM 163983, 12100' (male); USNM 163975-163979 (4 males, 1 female), USNM 163981-163982 (2 females), USNM 163984 (male), USNM 163986-163991 (3 males, 3 females), USNM 163993-163994 (male, female), USNM 163997-163998 (male, female), USNM 164000 (female), USNM 164003-164004 (2 females), USNM 165509 (male), USNM 165511 (female), 9000'-12100', USNM 589820, Naro Moru Gate, 10000' (male); ZFMK 2003.702 (female), Mt Kenya N.P., 2950 m, Chagoria trail.

REFERENCES

Cameron, A, (1997): Small mammal community composition on Mt. Elgon, Uganda with reference to habitat modification by humans. Honours Dissertation for BSc Tropical Environmental Science. Aberdeen University. Unpublished (not seen).

Carleton, M. D., Kerbis Peterhans, J. C. & Stanley, W. T. (2006): Review of the *Hylomyscus denniae* group (Rodentia: Muridae) in eastern Africa, with comments on the generic allocation of *Epimys endorobae* Heller. Proceedings of the Biological Society of Washington **119**: 293–325.

Carraway, L. N. (1990): A morphologic and morphometric analysis of the "*Sorex vagrans* species complex" in the Pacific coast region. Special Publication, Museum of Texas Tech University **32**: 1–76.

Clausnitzer, V. (2001): Rodents of the afro-alpine zone of Mt. Elgon. Pp. 427–443 in: Denys, C., Granjon, L. & Poulet, A. (eds.): African Small Mammals. Paris, IRD editions.

Clausnitzer, V. & Kityo, R. (2001): Altitudinal distribution of rodents (Muridae and Gliridae) on Mt. Elgon, Uganda. Tropical Zoology **14**: 95–118.

Clausnitzer, V., Churchfield, S. & Hutterer, R. (2003): Habitat occurrence and feeding ecology of *Crocidura montis* and *Lophuromys flavopunctatus* on Mt. Elgon, Uganda. African Journal of Ecology **41**: 1–8.

Davenport, T., Howard, P., Dickenson, C. (1996): Mount Elgon Biodiversity Report. Republic of Uganda Forest Department, P.O. Box 1752, Kampala, Uganda.

DeBlase, A. F. & Martin, R. E. (1974): A Manual of Mammalogy with Keys to the Families of the World. W. C. Brown Company Publishers, Dubuque, Iowa.

Dippenaar, N. J. (1977): Variation in *Crocidura mariquensis* (A. Smith, 1844) in southern Africa, Part 1 (Mammalia: Soricidae). Annals of the Transvaal Museum **30**: 163–206.

Duncan, P. & Wrangham, R.W. (1971): On the ecology and distribution of subterranean insectivores in Kenya. Journal of Zoology **164**: 149–163

Granvik, H. (1924): Mammals from the eastern slopes of Mount Elgon, Kenya Colony. Lunds Universitets Årsskrift XXI **3**: 4–32.

Hollister, N. (1916): Descriptions of a new genus and eight new species and subspecies of African Mammals. Smithsonian Miscellaneous Collections **66** (1): 1–8.

Hollister, N. (1918): East African mammals in the United States National Museum. Part I. Insectivora, Chiroptera, and Carnivora. Bulletin of the United States National Museum **99**: 1–194, 55 pls.

Hutterer, R., Barriere, P. & Colyn, M. (2002): A new myosoricine shrew from the Congo Basin referable to the forgotten genus *Congosorex* (Mammalia: Soricidae). Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie **71**, Suppl.: 7–16.

Hutterer, R. & Kock, D. (2002): Recent and ancient records of shrews from Syria, with notes on *Crocidura katinka* Bate, 1937 (Mammalia: Soricidae). Bonner Zoologische Beiträge **50**: 249–258.

Lonnberg, E. (1918): Mammifères recuellis dans la règion du Mont Elgon par le Dr. Bayer, en 1914. Revue Zoologie Africaine **5**: 172–192.

Loring, J.A. 1910. Appendix C, p. 549. In: African Game Trails, T. Roosevelt. Charles Scribners' Sons, New York.

Meester, J. (1958): Variation in the shrew genus *Myosorex* in southern Africa. Journal of Mammalogy **39**: 325–329.

Meester, J. (1963): A systematic revision of the shrew genus *Crocidura* in southern Africa. Transvaal Museum Memoir **13**: 1–125.

Stanley, W. T., Rogers, M. A. & Hutterer, R. (2005): A new species of *Congosorex* from the Eastern Arc Mountains (Tanzania), with significant biogeographical implications. Journal of Zoology **265**: 269–280.

Thomas, O. (1906): Two new genera of small mammals discovered by Mrs. Holms-Tarn in British East Africa. Annals and Magazine of Natural History **7** (18): 222–226.

Thorn, E. & Kerbis Peterhans, J. (2009): Small mammals of Uganda. Bonner zoologische Monographien **55**: 1–164.

Author's addresses: Dr. Julian C. Kerbis Peterhans, jkerbis@fieldmuseum.org, College of Professional Studies, 430 S. Michigan Ave., Chicago, IL 60605, U.S.A.; William T. Stanley, Division of Mammals, Field Museum of Natural History, Chicago, Illinois, 60605-2496, U.S.A.; Dr. Rainer Hutterer, Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, D-53113 Bonn, Germany; Terrence C. Demos, Department of Biology, The Graduate Center, City University of New York, New York, U.S.A.; Bernard Agwanda, Mammal Section, National Museums of Kenya, P.O.Box 40658, Nairobi, Kenya.

Received: 16.05.2008
Accepted: 20.03.2009